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CASE REPORT

Successful extracorporeal resuscitation after perioperative anaphylactic shock during living donor liver transplantation

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Summary A 46-year-old man was admitted for emergent donor hepatectomy. His circulatory condition became unstable 75 minutes after induction and then deteriorated to ventricular fibrillation due to latex-induced anaphylaxis. Following 35 minutes of futile conventional resuscitation without spontaneous cardiac rhythm, extracorporeal resuscitation was initiated and electric cardiac activity returned 10 minutes later. He was discharged home without any sequelae. Extracorporeal cardiopulmonary resuscitation would offer an alternative choice compared with conventional cardiopulmonary resuscitation.

1. Introduction

Few details of the complications among living liver donors were revealed.[1] Perioperative anaphylaxis may lead to devastating results, even death. Extracorporeal life support would offer an alternative choice compared with conventional cardiopulmonary resuscitation.[2–4] Sharing the experience in the management of morbidity and mortality in these patients would assist the improvement of care.

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2. Case report

A 46-year-old man, American Society of Anesthesiologists physical status 1, was scheduled to undergo emergent living donor hepatectomy. He had no previous medical history and denied any allergic reaction. His occupation is dentistry.

The initial vital signs were blood pressure of 149/98 mmHg, heart rate of 90 beats/min, and oxygen saturation of 99%. Thoracic epidural catheterization (B. Braun, Melsunge, Germany) was performed prior to induction of anesthesia. At 7:00 PM, general anesthesia was induced with fentanyl, 2% xylocaine, and propofol h using a target-controlled infusion device (Orchestra Base primea, Fresenius vial, Brezins, France). Rocuronium was administered intravenously for intubation. Anesthesia was maintained with propofol, cisatracurium, and epidural anesthesia with 0.25% bupivacaine infusion. An 8-Fr, 2-lumen catheter (Blue FlexTip, ARROWgard Blue catheter, ARROW International, Inc., Asheboro, NC, USA) in the right internal jugular vein, and a 20-gauge catheter in the right radial artery, were placed without difficulty.

At 7:45 PM, 1 g cefazolin was administered intravenously and the surgery was started. At 8:15 PM, the blood pressure fell to 55/35 mmHg, the heart rate was 90 bpm, and oxygen saturation was 99% whereas cholecystectomy had been completed. Neither skin rash nor change of airway pressure was noted at that time. Blood loss was minimal and the surgeons did not compress any major blood vessels. An arterial blood gas analysis showed pH 7.37, $PaCO_2$ 38.9 mmHg, PaO_2 98.6 mmHg, Na^+ 140 mmol/L, K^+ 3.7 mmol/L, and Ca^{2+} 0.92 mmol/L. After administering 20 mg ephedrine, 20 mcg norepinephrine, 400 mcg epinephrine, and continuous infusion of 9.26 mcg/kg/min of dopamine intravenously, there were no improvements in radial blood pressure.

At 8:40 PM, generalized erythema was observed and anaphylaxis was highly suspected. Oxygen ($FiO_2 = 1.0$) was used for ventilation, and propofol, cisatracurium, and bupivacaine infusion were all stopped. We administered 200 mg hydrocortisone and 1 mg epinephrine bolus intermittently. However, the arterial blood pressure was still approximately 50—60/20—30 mmHg. At 8:45 PM, the patient's hemodynamics deteriorated to ventricular fibrillation. Four attempts at defibrillation with 200 joules with a total dose of 22 mg epinephrine were unsuccessful, so we decided to use extracorporeal life support. At 9:20 PM, the extracorporeal life support was initiated and the return of spontaneous circulation was noted 10 minutes later.

Surgery was abandoned and the patient was transferred to the intensive care unit. Extracorporeal life support was weaned after 4 hours under catecholamine support. After this event, the patient mentioned that he often has had erythematous change over the hands and red eyes after wearing gloves for work. Serum tryptase during the episode of anaphylaxis was 64.8 mcg/L and it decreased to 5.7 mcg/L 2 days later (biological reference: 1—15 mcg/L). Immunoglobulin E (IgE) k-82-Latex test, a latex-specific IgE antibody serology test, showed 9.09KU/L (Rast class: high, 3.5—17.5). He had a skin test positive for latex and negative reaction for other medications, including cefazolin, fentanyl, propofol, 2% xylocaine, bupivacaine, cisatracurium, and rocuronium. The patient made an uneventful recovery from this episode.

3. Discussion

The most serious complication of living donor liver transplantation is mortality.[5] A recent review documented 33 living liver donor deaths worldwide.[1] Few details are provided about the deaths, but it seems that the surgical donation procedure was the main cause. Only one death was associated with anesthesia due to anaphylaxis.[1]

The incidence of perioperative anaphylaxis is estimated to be 1 in 6,000—20,000 adult anesthetic procedures.[6,7] The most common agents of perioperative anaphylaxis are neuromuscular blocking drugs (60%), followed by latex (12—16%) and antibiotics (8%).[7] Anaphylaxis usually takes place shortly after induction but may happen any time with any allergenic medications.[8] The onset of hypotension of our patient was at 75 minutes after the induction of anesthesia, and 30 minutes after use of an antibiotic and the incision of the skin, respectively. However, multiple drugs had been used, so it was difficult to establish the culprit agent for anaphylaxis at that moment. Meanwhile, the surgeon's gloves were keeping contact with the patient's mesentery and continuous latex stimulation may be the reason why his circulatory status did not improve despite various treatments.

For adult in-hospital cardiac arrest of cardiac origin, patients may benefit from extracorporeal life support with both short- and long-term survival advantages compared with conventional cardiopulmonary resuscitation.[2] In several case reports of anaphylaxis followed by cardiac arrest, cardiopulmonary bypass has been a successful treatment.[3,4] However, the requirement of professional skills and the availability of extracorporeal cardiopulmonary resuscitation limit its usage.[9]

Compared to the additional costs of diagnosis, treatment, and payment for disabilities or even mortalities caused by anaphylaxis from latex, avoidance of latex-containing products may be much more cost effective.[10] Lin et al[11] showed that those who are in the medical profession have a higher risk of anaphylaxis from latex. In our hospital, we cannot completely avoid latex-containing products. Thus, identifying the patients having higher risks of allergy to latex is important. More efforts should be made to confirm that no history was missing during preoperative evaluation.

A donor hepatectomy carries all the risks associated with hospitalization, anesthesia, and a major surgical procedure. To increase acceptance of living liver donor transplantation, medical centers should share information and publish data regarding complications and deaths to improve the quality of care of all donors.[5] Donor safety is extremely important. To rescue and resuscitate a donor during the occurrence of a crisis such as anaphylactic shock is important. More rapid response and more advanced procedure such as extracorporeal life support should be applied as early as possible if the initial conventional resuscitation fails. We hope that sharing our experience in this case will lead to better care of donors.

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